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APPEAL BRIEF

Applicant	:	NAKAMORI et al.
App. No	:	10/536,621
Filed	:	May 26, 2005
For	:	POLISHING PAD AND METHOD OF PRODUCING SEMICONDUCTOR DEVICE
Examiner	:	Sylvia MaCarthur
Art Unit	:	1716
Conf. No.	:	9275

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the Notice of Appeal filed, Applicants submit this Appeal Brief. Applicant appeals the final rejection of Claims 1-4, 7, 13, and 15-22 set forth in the final Office Action issued June 14, 2010. (hereafter, the "the Office Action")

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I. REAL PARTY IN INTEREST

The real party in interest in the present application is TOYO TIRE & RUBBER CO., LTD., which is the assignee of the present application.

II. RELATED APPEALS AND INTERFERENCES

Appellants do not have any knowledge of related appeals, interferences or judicial proceedings that may directly affect or have bearing on the decision of the Board of Appeals and Interferences (hereafter, the "Board") in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-4, 7, 13, and 15-22, which are attached hereto as an appendix, are pending in the application. Claims 5, 6, 8-12, and 14 have been canceled. Claims 22 have been withdrawn requesting rejoinder. Claims 1-4, 7, 13, and 15-22 all stand rejected, and are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments have been made in response to the Office Action. All amendments submitted to the Office Action have been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present application includes two independent claims. Each independent claims is summarized below, with reference to the pages and line numbers of the filed application, as required by 37 C.F.R. § 41.37(c)(1)(v). These citations are described in the application, and not intended to limit the claims.

Claim 1

Claim 1 is directed to an apparatus for chemical mechanical polishing of material to be polished in conjunction with the material to be polished, comprising

said material to be polished and a polishing pad used in chemical mechanical polishing (see, e.g., page 1, lines 5-7) and

having a polishing region and a light-transmitting region, said polishing pad having at least one of the following characteristics (see, e.g., page 7, lines 21-22):

i) light transmittance in the light-transmitting region throughout the wavelength range of 400 to 700 nm is 50% or more (see, e.g., page 7, lines 22-24); or

ii) ii) a thickness of the light-transmitting region is 0.5 to 4 mm, and light transmittance in the light-transmitting region throughout the wavelength range of 600 to 700 nm is 80% or more (see, e.g., page 10, lines 6-9);

wherein the light-transmitting region is arranged between a central portion and a peripheral portion of the polishing pad (see, e.g., page 11, lines 7-8), and

a length (D) of the light transmitting region in a diametrical direction is 3 times or more longer than a length (L) in a circumferential direction (see, e.g., page 11, lines 8-10),

wherein a length (D) in a diametrical direction is 1/4 to 1/2 relative to the diameter of a material to be polished (see, e.g., page 13, lines 11-14), and

a scatter of the thickness of the light-transmitting region is 100 μm or less (see, e.g., page 13, lines 22-23),

wherein materials for forming the polishing region and the light-transmitting region are polyurethane resin (see, e.g., page 13, line 24 – page 14, line 1), and

the polyurethane resin as the material for forming the polishing region and the polyurethane resin as the material for forming the light-transmitting region are different materials but produced from the same kinds of organic isocyanate, polyol and chain extender (see, e.g., page 14, lines 1-5), and

wherein the polyurethane resin as the material for forming the light-transmitting region does not contain aromatic polyamine (see, e.g., page 22, lines 21-23) and

the material for forming the light transmitting region is non-foam (see, e.g., page 14, lines 16-17),

wherein a material for forming the polishing region is fine-cell foam (see, e.g., page 15, lines 8-9).

Claim 20

Claim 20 is directed to an apparatus for chemical mechanical polishing of material to be polished in conjunction with the material to be polished, comprising

said material to be polished and a polishing pad used in chemical mechanical polishing (see, e.g., page 1, lines 5-7) and

having a polishing region and a light-transmitting region, said polishing pad having at least one of the following characteristics (see, e.g., page 7, lines 21-22):

i) light transmittance in the light-transmitting region throughout the wavelength range of 400 to 700 nm is 50% or more (see, e.g., page 7, lines 22-24); or

ii) a thickness of the light-transmitting region is 0.5 to 4 mm, and light transmittance in the light-transmitting region throughout the wavelength range of 600 to 700 nm is 80% or more (see, e.g., page 10, lines 6-9);

wherein the light-transmitting region is arranged between a central portion and a peripheral portion of the polishing pad (see, e.g., page 11, lines 7-8), and

a length (D) of the light transmitting region in a diametrical direction is 3 times or more longer than a length (L) in a circumferential direction (see, e.g., page 11, lines 8-10),

wherein a length (D) in a diametrical direction is 1/4 to 1/2 relative to the diameter of a material to be polished (see, e.g., page 13, lines 11-14), and

a material for forming the polishing region is fine-cell foam, wherein a compression recovery of the fine-cell foam is 50 to 100% (see, e.g., page 16, lines 15-16),

wherein materials for forming the polishing region and the light-transmitting region are polyurethane resin (see, e.g., page 13, line 24 – page 14, line 1), and

the polyurethane resin as the material for forming the polishing region and the polyurethane resin as the material for forming the light-transmitting region are different materials but produced from the same kinds of organic isocyanate, polyol and chain extender (see, e.g., page 14, lines 1-5), and

wherein the polyurethane resin as the material for forming the light-transmitting region does not contain aromatic polyamine (see, e.g., page 22, lines 21-23) and

the material for forming the light transmitting region is non-foam foam (see, e.g., page 14, lines 16-17).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds of rejections are to be reviewed on appeal:

1. The rejections of Claims 1-4, 7, 13, and 15-21 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ishikawa et al. U.S. Publication Number 2002/0042243 in view of Shimomura et al. Japanese publication 2002-275933.

2. The rejections of Claims 1, 7, 13, and 15-21 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Takashi et al. Japanese Publication Number 11-77517 in view of Halley U.S. Patent Number 6,361,647 and Shimomura et al. Japanese publication Number 2002-275933.

3. The rejections of Claims 1-4 and 7 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hasegawa Toru Japanese Publication Number 2002-324770 in view of Halley U.S. Patent Number 6,361,647 and Shimomura et al. Japanese publication Number 2002-275933.

VII. ARGUMENT

A. The Examiner erred by rejecting Claims 1-4, 7, 13, and 15-21 under 35 U.S.C. § 103(a) over Ishikawa et al. in view of Shimomura et al.

The Examiner has rejected Claims 1-4, 7, 13, and 15-21 under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa et al. U.S. Publication Number 2002/0042243 in view of Shimomura et al. Japanese publication 2002-075933.

Standard of *Prima facie Obviousness*

The Examiner bears the initial burden to establish and support a *prima facie* case of obviousness. *In re Rinehart*, 531 F.2d 1048, 189 U.S.P.Q. 143 (C.C.P.A. 1976). To establish a *prima facie* case of obviousness, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Further, it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983). In addition, in determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 U.S.P.Q. 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 U.S.P.Q. 698 (Fed. Cir. 1983).

Discussion of Ishikawa

U.S. Publication Number 2002/0042243 to Ishikawa et al. ("Ishikawa") discloses a polishing pad with a working surface and a hole in which a transparent window plate is inserted so as to provide a measurement window. See Ishikawa, FIG. 3 and Abstract. In the SUMMARY OF THE INVENTION section, Ishikawa teaches to maintain the amount of recess of the window plates with respect to the surface of the polishing body and the transparent material being formed by a laminates of two or more plates. See Ishikawa, paragraph [0026] and [0028]. Ishikawa further specifies the compressive elastic module of the material and the transmissivity of the window plates. See Ishikawa, paragraph [0031] and [0053].

In the DEATILED DESCRIPTION OF THE PREFERED EMBODIMENTS and FIG.12, Ishikawa described that the reflective spectrum from the surface of the silicon wafer will be deteriorated during polishing process and the window plate needs to be switched. See Ishikawa, paragraph [0196] – [0198] and curve(a) and (b) in FIG. 12 . In the graph shown in FIG. 12, the horizontal axis indicates wavelength, while the vertical axis indicates the intensity ratio of the measured reflective spectrum to a standard reflective spectrum obtained in a case where a silicon wafer on which an aluminum film has been formed was installed on top of the window part of the polishing body in a state in which ion exchange water was interposed instead of the polishing agent.

Discussion of Shimomura

Japanese Publication Number 2002-075933 to Shimomura et al. ("Shimomura") discloses a polishing pad in three layer structure made from polyurethane resin, the average cell diameter in which is 10-50 μm or less. Shimomura does not teach a light-transmitting region. See Shimomura, paragraph [0013] and Fig. 1.

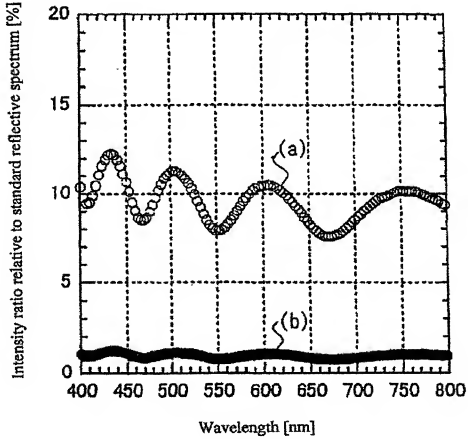
Discussion of Claims 1-4, 7, 13, and 15-21

Pending independent Claims 1 and 20 recites, among other things, "light transmittance in the light-transmitting region throughout the wavelength range of **400 to 700 nm is 50% or more**; or ii) a thickness of the light-transmitting region is 0.5 to 4 mm, and light transmittance in the light-transmitting region throughout the wavelength range of **600 to 700 nm is 80%** or more; (emphasis added). Applicant respectfully submits that the Examiner has not established a prima facie case of obviousness because Claims 1 and 20 include limitations not taught or suggested by the cited references and the Examiner fails to consider the claimed invention as a whole.

In rejecting the claims, the Examiner reads the claimed combination of the wavelength and light transmittance on Figure 12 of Ishikawa. However, Ishikawa does not disclose the claimed wave length ranges in connection with light transmittance. Fig 12 of Ishikawa merely shows the difference of the intensity ratio of the measured reflective spectrum to a standard reflective spectrum between an initial value (curve a) and a value after the polishing of 150th silicon wafer (curve b) in the broad wave length of 400-800 nm. See Ishikawa, paragraph [0196]

and [0197]. Further, as can be seen in below attached Figure 12 of Ishikawa, no characteristic difference of the intensity ratio throughout the wavelength has been seen. Although, Ishikawa teaches that the transmissivity of the window plates be set at 22% or greater (paragraph [0053]), this broad transmissivity range also fails to associate with the any particular wave length light transmittance. Shimomura does not cure the noted deficiencies in Ishikawa. Thus, one having ordinary skill in the art could in no way derive the recited wavelength in connection with the light transmittance from only the cited references.

Figure 12 of Ishikawa



Moreover, As shown in Table 1 of the present specification, Example 1 and 2 with the transmittance above 70% in the light-transmitting region throughout the wavelength range of 400 to 700 nm indicates **very good** reproducibility (indicated by ○ ○), Example 3 with transmittance of 51.4% at the wave length of 400 nm, which is slightly above the claimed range, shows **good** reproducibility (indicated by ○), and Comparative example 1, with transmittance of 14.7% at the

wavelength range of 400 nm shows poor result. Further, as for an alternative, the claims also recites that the light transmittance throughout the wave length the range of 600 to 700 nm is 80% or more. This alternative also provides unexpected results as shown by the data reported in Table 2 of Applicant's specification. In particular, Examples 4 and 5 with light transmittance on the recited region above 90% provide good detection of film thickness, while Comparative Example 2 with light transmittance about 75% does not. Such results are completely unexpected in view of the prior art and indicates the criticality of the cited range. These unexpected results and evidence indicating that the claimed ranges are critical can support patentability. See MPEP 2144.05(II) and 2144.05(III)

Thus, for the reason discussed above, Appellant respectfully submits that the Examiner erred in rejecting Claims 1 and 20 over Ishikawa in view of Shimomura, and respectfully request the withdrawal of the rejection. As Claims 2-4, 7, 13,15-19, and 21 depend from Claim 1, Appellant respectfully submits that the Examiner erred in rejecting these claims for at least the same reasons discussed with respect to Claims 1 and 20, and respectfully requests the withdrawal of their rejections as well.

B. The Examiner erred by rejecting Claims 1, 7, 13, and 15-21 under 35 U.S.C. § 103(a) over Takashi et al. in view of Halley and Shimomura et al.

The Examiner has rejected Claims 1, 7, 13, and 15-21 under 35 U.S.C. § 103(a) as being unpatentable over Takashi et al. Japanese Publication Number 11-77517 in view of Halley U.S. Patent Number 6,361,647 and Shimomura et al. Japanese publication Number 2002-275933.

Discussion of Takashi

Japanese Publication Number 2002-275933 to Takashi (Arai) et al. ("Takashi") discloses a polishing pad with a polishing region and a light transmitting region, the light-transmitting region is arranged between a central portion and a peripheral portion of the polishing pad, and a length (D) of the light transmitting region in a diametrical direction is 3 times or more longer than a length (L) in a circumferential direction. See Takashi, Abstract and Figure 8. Takashi does not teach the transmissivity of the light transmitting region in connection with the wave length.

Discussion of Halley

U.S. Patent Number 6,361,647 to Halley discloses a chemical mechanical polishing method based on a offset distance and velocity profile and apparatus. See Halley, Abstract. Halley does not teach the transmissivity of the light transmitting region in connection with the wave length.

Discussion of Claims 1, 7, 13, and 15-21

In rejecting the claims, the Examiner appears to reads limitation iii) "the light-transmitting region is arranged between a central portion and a peripheral portion of the polishing pad, and a length (D) of the light transmitting region in a diametrical direction is 3 times or more longer than a length (L) in a circumferential direction, wherein a length (D) in a diametrical direction is 1/4 to 1/2 relative to the diameter of a material to be polished, and a scatter of the thickness of the light-transmitting region is 100 μm or less." However the Examiner fails to realize that the instant limitation is no longer an alternative as amended on September 21, 2009.

As none of the cited references disclose the transmissivity of the light transmitting region in connection with the wave length, the previous argument is equally applicable here.

Thus, Appellant respectfully submits that the Examiner erred in rejecting Claims 1 and 20 over Takashi et al. in view of Halley and Shimomura et al. and respectfully request the withdrawal of the rejection. As Claims 7, 13, 5-19, and 21 depend from Claim 1, Appellant respectfully submits that the Examiner erred in rejecting these claims for at least the same reasons discussed with respect to Claims 1 and 20, and respectfully requests the withdrawal of their rejections as well.

C. The Examiner erred by rejecting Claims 1-4 and 7, under 35 U.S.C. § 103(a) over Hasegawa Toru in view of Halley and Shimomura et al.

The Examiner has rejected Claims 1-4 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Hasegawa Toru. Japanese Publication Number 2002-324770 in view of Halley U.S. Patent Number 6,361,647 and Shimomura et al. Japanese publication Number 2002-275933.

Discussion of Hasegawa Toru

Japanese Publication Number 2002-324770 to Hasegawa Toru ("Hasegawa") discloses a polishing pad with a polishing region and a light transmitting region with transmissivity of 0.1% or more in the range of wavelength of 400 – 800nm.

Discussion of Claims 1, 4, and 7

In rejecting the claims, the Examiner took the position that Hasegawa disclose the claimed transmissivity of the light transmitting region in connection with the wave length. However, Hasegawa merely teaches broad transmissivity range and this broad transmissivity range also fails to associate with the any particular wave length light transmittance. The rest of the cited references do not cure the noted deficiencies in Hasegawa. Thus, one having ordinary skill in the art could in no way derive the recited wavelength in connection with the light transmittance from only the cited references.

Thus, Appellant respectfully submits that the Examiner erred in rejecting Claims 1, 4, and 7 over Hasegawa Toru in view of Halley and Shimomura et al. and respectfully request the withdrawal of the rejection. As Claims 4 and 7 depend from Claim 1, Appellant respectfully submits that the Examiner erred in rejecting these claims for at least the same reasons discussed with respect to Claim 1, and respectfully requests the withdrawal of their rejections as well.

CONCLUSION

For at least the reasons explained above, Appellants respectfully submit that the rejections of Claims 1-4, 7, 13, and 15-21 are improper and should be reversed.

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Dated: November 15, 2010 By: 

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VIII. CLAIMS APPENDIX

1 (previously presented): An apparatus for chemical mechanical polishing of material to be polished in conjunction with the material to be polished, comprising said material to be polished and a polishing pad used in chemical mechanical polishing and having a polishing region and a light-transmitting region, said polishing pad having at least one of the following characteristics: i) light transmittance in the light-transmitting region throughout the wavelength range of 400 to 700 nm is 50% or more; or ii) a thickness of the light-transmitting region is 0.5 to 4 mm, and light transmittance in the light-transmitting region throughout the wavelength range of 600 to 700 nm is 80% or more;

wherein the light-transmitting region is arranged between a central portion and a peripheral portion of the polishing pad, and a length (D) of the light transmitting region in a diametrical direction is 3 times or more longer than a length (L) in a circumferential direction, wherein a length (D) in a diametrical direction is 1/4 to 1/2 relative to the diameter of a material to be polished, and a scatter of the thickness of the light-transmitting region is 100 μm or less

wherein materials for forming the polishing region and the light-transmitting region are polyurethane resin, and the polyurethane resin as the material for forming the polishing region and the polyurethane resin as the material for forming the light-transmitting region are different materials but produced from the same kinds of organic isocyanate, polyol and chain extender, and

wherein the polyurethane resin as the material for forming the light-transmitting region does not contain aromatic polyamine and the material for forming the light transmitting region is non-foam,

wherein a material for forming the polishing region is fine-cell foam.

2 (previously presented): The polishing pad according to claim 1, wherein a rate of change of the light transmittance in the light-transmitting region in wavelengths of 400 to 700 nm represented by the following equation is 50% or less:

the rate of change (%) = {(maximum transmittance in 400 to 700 nm – minimum transmittance in 400 to 700 nm)/maximum transmittance in 400 to 700 nm}×100.

3 (previously presented): The polishing pad according to claim 1, wherein the light transmittance in the light-transmitting region at a wavelength of 400 nm is 50% or more, and the transmittance in the light-transmitting region throughout the wavelength range of 500 to 700 nm is 90% or more.

4 (previously presented): The polishing pad according to any one of claim 1, wherein a difference among respective light transmittances in the light-transmitting region in 500 to 700 nm is 5% or less.

5-6 (canceled)

7 (previously presented): The polishing pad according to claim 1, wherein a shape of the light-transmitting region is rectangular.

8 -12 (canceled)

13 (previously presented): The polishing pad according to claim 1, which does not have an uneven structure for retaining and renewing an abrasive liquid on a surface of the light-transmitting region on a polishing side.

14 (canceled)

15 (previously presented): The polishing pad according to claim 1, wherein a surface of the polishing region on a polishing side is provided with grooves.

16 (previously presented): The polishing pad according to claim 1, wherein an average cell diameter of the fine-cell foam is 70 μm or less.

17 (previously presented): The polishing pad according to claim 1, wherein a specific gravity of the fine-cell foam is 0.5 to 1.0 g/cm^3.

18 (previously presented): The polishing pad according to claim 1, wherein a hardness of the fine-cell foam is 45 to 65° in terms of Asker D hardness.

19 (previously presented): The polishing pad according to claim 1, wherein a compressibility of the fine-cell foam is 0.5 to 5.0%.

20 (previously presented): An apparatus for chemical mechanical polishing of material to be polished in conjunction with the material to be polished, comprising said material to be polished and a polishing pad used in chemical mechanical polishing and having a polishing region and a light-transmitting region, said polishing pad having at least one of the following characteristics: i) light transmittance in the light-transmitting region throughout the wavelength

range of 400 to 700 nm is 50% or more; or ii) a thickness of the light-transmitting region is 0.5 to 4 mm, and light transmittance in the light-transmitting region throughout the wavelength range of 600 to 700 nm is 80% or more;

wherein the light-transmitting region is arranged between a central portion and a peripheral portion of the polishing pad, and a length (D) of the light transmitting region in a diametrical direction is 3 times or more longer than a length (L) in a circumferential direction, wherein a length (D) in a diametrical direction is 1/4 to 1/2 relative to the diameter of a material to be polished, and a material for forming the polishing region is fine-cell foam, wherein a compression recovery of the fine-cell foam is 50 to 100%

wherein materials for forming the polishing region and the light-transmitting region are polyurethane resin, and the polyurethane resin as the material for forming the polishing region and the polyurethane resin as the material for forming the light-transmitting region are different materials but produced from the same kinds of organic isocyanate, polyol and chain extender, and

wherein the polyurethane resin as the material for forming the light-transmitting region does not contain aromatic polyamine and the material for forming the light transmitting region is non-foam.

21 (previously presented): The polishing pad according to claim 1, wherein a storage elastic modulus of the fine-cell foam at 40°C at 1 Hz is 200 MPa or more.

22 (withdrawn): A method of producing a semiconductor device, which comprises a step of polishing a surface of a semiconductor wafer with the polishing pad recited in claim 1.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None

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